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*Japan.*—As noted last week, cholera has invaded a number of localities in Japan, and recent reports indicate it is increasing to some extent.

*Italy.*—During the two weeks ended September 24, 11 cases of cholera were reported at Cagliari in Sardinia.

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#### POLIOMYELITIS (INFANTILE PARALYSIS).

*Buffalo.*—The outbreak of poliomyelitis (infantile paralysis) at Buffalo is rapidly subsiding. During the week ended October 19 only 6 cases of the disease were reported and of these 2 had had their onset several weeks previously.

*Alaska.*—Passed Asst Surg Krulish has reported the presence of poliomyelitis (infantile paralysis) among the Eskimo of St. Michael and Unalakleet, Alaska. There were 5 cases with 1 death at St. Michael and 10 cases with 2 deaths at Unalakleet. The two villages are only 45 miles apart and there is much communication between them. The disease apparently appeared at Unalakleet a week or more before it did at St. Michael.

Poliomyelitis has been previously recorded in Alaska as follows: In 1908, at Sitka, 5 cases with 2 deaths. In 1910, at Douglas, 7 cases; at Chicagoff, 1 case; and at Yakutat, 1 case.

#### TRANSMISSION OF POLIOMYELITIS BY MEANS OF THE STABLE FLY (STOMOXYS CALCITRANS).

By JOHN F. ANDERSON, Director Hygienic Laboratory, and WADE H. FROST, Passed Assistant Surgeon, United States Public Health Service.

As a result of the thorough epidemiologic studies of poliomyelitis conducted by the Massachusetts State Board of Health from 1907 to 1912, under the direction of Dr. Mark W. Richardson, secretary of the board, evidence was collected which led the investigators to strongly suspect that the common stable fly (*Stomoxys calcitrans*) played an important part in the spread of this disease.

At the joint session of Sections I and V of the Fifteenth International Congress on Hygiene and Demography in Washington, September 26, 1912, Dr. Milton J. Rosenau, of the Harvard Medical School, who has been working in conjunction with the Massachusetts State Board of Health, announced the result of an experiment which seemed to confirm most strikingly the inferences drawn from the epidemiologic work above mentioned.

Dr. Rosenau stated that he had infected several monkeys with poliomyelitis by intracerebral inoculation, exposed them daily—from the time of inoculation till death—to the bites of several hundred *Stomoxys*, at the same time exposing 12 fresh monkeys to the bites of the same flies. At the time the announcement was made six of these 12 monkeys were reported as having developed symptoms characteristic of poliomyelitis, i. e., illness followed by more or less extensive paralysis. Of these 6 monkeys 2 had died, 3 were paralyzed at that time, and 1 recovered after a brief illness. In the cord of one of

the monkeys that had died were found the characteristic lesions of poliomyelitis, that is, perivascular infiltration and destruction of the motor cells of the anterior cornu. The cord of the other monkey was reported to have shown changes less characteristic of poliomyelitis, namely, degenerations of the motor cells without perivascular infiltration.

At the time of announcement a sufficient interval had not elapsed to determine the result of the attempt to transmit the infection to other monkeys by inoculation with the cord of one of the two that had died.

This experiment, giving an altogether new direction to the experimental study of poliomyelitis, appeared of sufficient importance to warrant an immediate attempt at confirmation.

In the experiment below reported it has been our object to repeat, as nearly as possible, the conditions of that reported by Dr. Rosenau, and we are indebted to him for assistance and advice in the details of the experiment.

On October 3, rhesus No. 242 was inoculated intracerebrally with an emulsion of the cord of a monkey which had died of poliomyelitis. The virus used is a strain originally obtained from the Rockefeller Institute for Medical Research, kept at the Hygienic Laboratory for nearly two years, during which time it has been passed through a large series of monkeys.

Two hours after inoculation the infected monkey was exposed to the bites of about 300 *Stomoxys* recently collected in Washington. Thereafter until death, on October 8, this animal was exposed daily for about two hours to the bites of the same flies, plus additional fresh *Stomoxys* added from time to time as caught. This monkey (No. 242) developed characteristic complete paralysis on the afternoon of October 7 and died at 2 a. m. October 8.

Another monkey (rhesus No. 246), similarly inoculated on October 5, was then exposed daily to the bites of the same flies, beginning October 7. This monkey developed paralysis on the morning of October 9, soon becoming completely paralyzed and dying that afternoon.

Thus, from October 4 to October 9, inclusive, the flies used had access to two monkeys inoculated with poliomyelitis, first, rhesus No. 242, then rhesus No. 246. It may be noted that the incubation period in both these monkeys was very short—four days from inoculation to the development of paralysis.

Beginning October 4, two fresh monkeys (rhesus No. 243 and Java No. 241) were exposed daily for about two hours to the bites of these same flies; and beginning October 5 a third fresh monkey (rhesus No. 244) was similarly exposed. All three of these animals subsequently developed symptoms of poliomyelitis, as follows:

Java No. 241 was found completely paralyzed on the morning of October 12 and died a few hours later. At autopsy tubercles were found in the lungs, liver, and spleen.

Rhesus No. 244 showed paralysis of the hind legs on the same day (October 12), but was, nevertheless, exposed again to the bites of the *Stomoxys* from 10 a. m. till 2 p. m. At 3 p. m. the animal, being almost completely paralyzed, was chloroformed. At autopsy tubercles were found in the lungs, liver, and spleen; however, apparently not sufficient to have been the cause of death.

Rhesus No. 243, which had appeared well on the morning of October 13, was found at 4 o'clock that afternoon to have a partial paralysis of the right hind leg. The following morning the hind legs and right fore leg were almost completely paralyzed. By 3.30 p. m. the neck also was paralyzed and the intercostal muscles somewhat affected. The animal was then chloroformed. At autopsy the internal organs appeared normal, except the spinal cord, which was edematous, the gray matter being congested. Sections of the cord, histologically examined, showed typical well-marked lesions of poliomyelitis; perivascular round-cell infiltration; foci of dense infiltration in the gray matter of the anterior horn; and destruction of some of the motor neurons.

The histologic examination of the cords of monkeys Nos. 241 and 244 has not yet been completed but it is believed, on the clinical evidence, that they died of poliomyelitis.

To summarize, three monkeys exposed daily to the bites of several hundred *Stomoxys*, which at the same time were allowed daily to bite two intracerebrally inoculated monkeys, developed quite typical symptoms of poliomyelitis eight, seven, and nine days respectively from the date of their first exposure.

In order to confirm the diagnosis of poliomyelitis in rhesus No. 243, 1 c. c. of an emulsion of the cord of this monkey was injected intracerebrally on October 14 into a healthy monkey (rhesus No. 250). This animal recovered promptly from the operation and remained apparently quite well till the morning of October 17, when a partial paralysis of the right fore leg was noted, progressing somewhat during the day. On the morning of October 18 both fore legs were completely paralyzed and the hind legs weak. In the afternoon of the same day the right hind leg was completely paralyzed, the left very weak, and the neck paralyzed. The monkey died at 10.30 p. m. and was immediately placed on ice until autopsy could be made at 9 a. m. October 19.

At the autopsy there was found some congestion of the lower lobe of both lungs, most marked on the left side, upon which the animal had been lying after paralysis developed. The meninges of the cord were markedly congested. On section, the cord appeared edematous, and the gray matter congested, showing minute hemorrhages. The site of inoculation appeared normal except for a slight clot. Cultures from this site have showed no growth. The other organs were normal in appearance.

Histologic examination of the cord showed lesions characteristic of poliomyelitis, intense congestion and perivascular infiltration, foci of round-cell infiltration here and there in the gray matter, destruction of the cells of the anterior cornu, and small hemorrhages in the anterior and posterior cornu.

#### CONCLUSION.

These results, in confirmation of those announced by Dr. Rosenau, would seem to demonstrate conclusively that poliomyelitis may be transmitted to monkeys through the agency of the stable fly (*Stomoxys calcitrans*).

It remains for further work to decide whether this is the usual or the only method of transmission in nature.